

! **SOME OBSERVATIONS ON THE ILLECELLEWAET AND ASULKAN
GLACIERS OF BRITISH COLUMBIA.**

BY GEORGE AND WILLIAM S. VAUX, JR.

With but a very few exceptions it seems to be a rule at the present time that all glaciers are receding up the valleys into which they extend. Whether this will be a permanent recession, or whether a period will come during which an advance will take place, time alone will tell. That there has been a permanent recession the numerous moraines below the prominent glaciers bear ample witness, but they also show that there have been many advances between the periods of recession.

The glaciers of the Canadian Rockies offer many attractions to those interested in their action, both on account of the newness of the region in which they are located and their marked activity. The Canadian Pacific Railway, without which this region would be almost inaccessible, was first opened but a little over a dozen years ago, and before that time it was practically an unbroken wilderness. Among the most accessible glaciers from the line of the railway are those in the vicinity of the Glacier House, which is situated in the heart of the Selkirk range, at an elevation of 4,122 feet above sea level. With this point as a centre a score of glaciers may be reached. It seems to form a natural station for their observation.

The most accessible, and in some respects one of the most remarkable, is the Great or Illecellewaet Glacier, situated about one and one-half miles in a direct line from the station. The immense névé which feeds it, lies on the top of the range forming the divide, and from it several branches flow down into as many valleys. The Great Glacier is notable on two accounts: its freedom from dirt at its foot, and the remarkable rapidity of the ice fall. One of the first persons to make observations on this glacier was Dr. William S. Green, F.R.G.S., who in 1888 spent some time in surveying and exploring the region. He records that in twelve days the centre of the ice moved twenty feet, while at the side it moved only

seven feet. He also notes "that the snout of the glacier showed evidence of retreat, for there were two rows of boulders in front of it. The outer one, about sixty feet from the ice, seemed to have been dropped the previous year; the inner row during the present year."¹

Since that time the glacier has been visited by a number of persons who have located the snout as respects certain marked rocks, or in some other way, but in many instances the record has become lost or uncertain so as to be of little value. At the present time the glacier is rapidly receding, and from an examination of the bare moraine and scrub below it, there seems to be evidence that this has been going on actively for a comparatively short period.

July 16, 1887—one year before Dr. Green—we first visited the glacier, and made a number of photographs of its foot (Pl. III). These photographs, after a lapse of over eleven years, make possible an exceedingly interesting comparison of the position of the ice. At the present time there is a broad space of loose boulders below the snout, utterly devoid of vegetation. In 1887 alder bushes grew within twenty feet of the ice. The slope of the ice was also very different from what it is now. There was then a great mass with steep sides extending over the present bare space, while now the ice slopes comparatively evenly till it dies away altogether in the stream. The fact that during eleven years the alder bushes have not advanced on the retreat of the ice, and that in 1887, when the photographs were taken, they were so close to it, would seem to indicate that at least for a score of years previous to 1887 the glacier had not extended materially further into the valley than it did at that time. Taking into consideration the border moraine marking the position of the ice in 1887, the alder bushes which then, as now, grew up to the lower side of the moraine, and which have increased but little in size during the eleven years, and the characteristic steepness of the slope of the ice, it would seem probable that a period of advance had occurred shortly before the year 1887. One very small moraine about 200 feet from the snout of 1898 showed an insignificant advance since that period, but apart from this the motion of the glacier appears to have been only of recession.

¹ Among the Selkirk Glaciers, by W. S. Green. Macmillan & Co., 1890, p. 219.

Photography seems to offer the most satisfactory means of permanently recording the position of the ice from year to year. On our visit, therefore, to the Great Glacier in 1898, a large rock was chosen on the south side of the trail, below the bridge, and some five hundred yards from the ice foot. The 1898 test view was taken from this position on the 19th of August (Pl. V). The small moraine in the lower right-hand corner is the one mentioned by Dr. Green, and shown in the pictures of 1887. The large rock marked "E" was then partly encased in the ice, as will be seen in the centre of the 1887 picture, and forms a most excellent point for identification (Pl. IV). In conjunction with the photograph a number of range rocks on the moraine were selected and marked for identification. The rocks "B" and "D" on the photograph were chosen because they were of unusual size, and were far enough from the ice to prevent any movement. A line drawn between them August 17, 1898, passed eighteen inches below the extreme snout of the glacier at "H." "B" is a large rock, with a triangular black mark on the north side. It was lettered with venetian red paint as follows:

$$\frac{86.-21-III A}{VIII-17-'98.} \left| \begin{array}{l} \blacktriangleright \\ \blacktriangleright \end{array} \right.$$

"D" is a yellow rock which has been split in halves. It was marked on one piece, "Rock opposite lines with snout, VIII-17-'98," and on the side opposite with a vertical line and two arrows. The rock "G" was not marked, but may be easily identified by the photograph. Its highest point was fifty-nine feet to the nearest ice on August 17, 1898.

To locate the position of the snout, the rock "C," a long, rounded boulder, was chosen. It was marked "60' 0" to snout, VIII-17-'98," and with arrows.

During the warm weather of August the rate of recession was very rapid, and a few days made a marked change in the position of the ice. October 24, 1898, Mr. Hugh B. Walkem, of Vancouver, visited the glacier and compared the position of the ice with the rocks marked by us, sixty-eight days before. He found that the snout had receded forty-six feet in that interval, or eight and one-tenth inches per day.

As respects the annual rate of recession it is hard to obtain reli-

able data as a foundation. There are several rocks on the moraine which bear marks or dates as old as 1890, but most of them are so worn as to be almost illegible. We found one, however, near the border moraine above referred to which, if it had not been moved, indicated that in August, 1890, the snout was sixteen feet above a certain mark. The distance from that mark to the snout in August, 1898, was four hundred and fifty-two (452) feet, or an average annual recession of fifty-six (56) feet, during the period of eight years. There is reason to believe, however, that for a part of this period the glacier remained more nearly stationary, and in the remaining years made up for the deficiency by a much more rapid melting away.

The Asulkan Glacier being situated at the head of the valley of the same name and about four miles distant from the Glacier House is not nearly so easy of access for observation. Its névé is connected with that of the Illecellewaet over the ridge which separates them, so that while they flow into separate valleys they rise from practically the same source. We are not aware that any work has been done upon this glacier, as it is probably not visited by more than a score of persons in the course of the year. The rapidly descending stream from its foot, which is joined by another from the glaciers in the immense amphitheatre to the east, passes through a narrow cañon a quarter of a mile below the snout. In this cañon there appeared to be no sign of glacial action, which would indicate that the ice had extended below this point only before the formation of the cañon. A very large moraine flanking the glacier on the west also pointed to the fact that the ice had not receded materially in recent years.

The same methods were pursued here as in the case of the Illecellewaet Glacier. A very large rock, the top of which was smoothly glaciated, was chosen on the east side of the stream below the glacier, and the test picture was taken, August 23, 1898 (Pl. VI). While it records the general outline of the ice, it does not locate the snout, which seemed to be deeply buried in moraine. Apart from thus fixing the position of the ice on this date, it was impossible to draw any conclusions, as there are no previous records with which to make comparisons.